



EXOTIC EDIBLE FRUIT TREES CONSERVED IN THE THIRUVANANTHAPURAM NAPIER MUSEUM AND ZOOLOGICAL PARK GARDEN

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Abstract

A detailed survey of exotic fruit trees conserved in the Thiruvananthapuram Napier Museum and Zoological park garden was conducted. Fifteen species could be identified as belonging to 12 different families and 15 genera. This article provides the list of exotic fruit trees studied along with their description and known nutritive value. Knowing the diverse possibilities and qualities of exotic tropical plants help in better domesticating and conserving them.

Key words: Thiruvananthapuram, Napier museum, zoological park, exotic, edible, fruit.

Introduction

Conservation of edible fruit trees and value addition to the underutilized wild edibles is of great importance, in this era where processed food has taken over nutrient-rich raw food sources. The use of ripe fruits as dessert is allied to traditional food habits. Both fruits and seeds are consumed in plenty, independent of the primary carbohydrate-rich meal (Meregini, 2005). There are a wide array of products which can be obtained from the edible fruit trees, including nuts and seeds, minor food supplements, spices, condiments, thickening agents and flavours, leafy vegetables, fresh fruits, fresh seeds, edible oil, fruit drinks, non-alcoholic beverages and alcoholic drinks. These edible forest tree produce are also cheap sources of vitamins, minerals, protein, carbohydrates and fats (Okafor, 1991).

Viewed from the perspective of conservation, it is mandatory to know what is being conserved and the diversity in the area that is being conserved. If we are not aware of the diversity of the flora or fauna of a particular place, we will never know when a few of them are lost. Therefore the cataloguing of our rich biodiversity is very important. It is mandatory to set up programmes on the identification and genetic improvement of species with high potential and for the development of techniques for conservation, development as well as production of both traditional and innovative products (Okafor, 1991).

Among the typical commercially available fruit trees in Kerala like orange, litchi, pear, apple and grape are all primarily exotic fruits. The importance of nutritious exotic fruits has to be taken into account when we think of finding new underutilized fruit crops that can thrive well in our tropical climatic conditions. Ex-situ conservation of underutilized fruit trees is essential to safeguard the genetic wealth and to use germplasm for genetic improvement. (Normah *et al.*, 2013). As part of a completed project on the documentation of the tree species of the Trivandrum Museum and Zoological Park garden, a few such exotic edible fruit-bearing trees could be identified.

Materials and Methods

The area covered in this investigation is the Government Botanic Gardens spread over more than fifty acres of land which also houses the Thiruvananthapuram Museum and Zoo. The study was conducted during 2014-2016 in the Trivandrum Museum and Zoo garden. The area we are investigating here has an ovoid rectangular shape. Identification, cataloguing, herbaria preparation and photograph collection of all the trees in the garden were made. Among which, the exotic fruit trees were identified and their potentials for commercial domestication was explored by previous literature survey.

During the field trips, all the tree species available in the study site were collected and documented. The

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relevant herbarium voucher specimens were preserved and identified. The collected information regarding the exotic fruit trees was documented. Identification of specimens was made using various floras.

Results and Discussion

The floristic analysis of the trees in the Government Botanic Gardens in the Thiruvananthapuram Museum and Zoological Park campus gives an idea about the distribution status of each species in the study area. A total of 257 tree species, under 192 genera, representing 55 families were documented during the study. The best representation is shown by the genera *Ficus*, with 16 species. The family Fabaceae with 39 members represented the highest number of species. Of all the trees listed, 15 trees belonging to 15 genera and 12 families (Table 1) was identified as exotic trees having edible fruits and seeds.

Each tree studied along with their nativity, plant description and value of the edible fruit is as follows:

***Adansonia digitata* L.:** Deciduous long-lived pachycauls tree, native to savannahs of sub-Saharan Africa, growing to 30 m tall. Radiocarbon dating of a baobab in Namibia indicated an age of about 1,275 years, making it one of the oldest known angiosperm. The tree bears very large, heavy, white flowers with the smell of carrion. Petals, 5 that are leathery and hairy on inside, 5 cup shaped petals, stamens numerous, with multiple anthers per stamen, style is 7-10 rayed. Bears large fruit with, hairy, hard shell. The fruit pulp, seeds, flowers, leaves, bark and root are all edible (Campbe, 1987). The fruit pulp is a rich source of vitamin C, calcium,

phosphorous, potassium, carbohydrate, fibers, proteins and lipids. (Rahul *et al.*, 2015).

***Aiphanes horrida* (Jacq.) Burret:** It is a solitary spiny palm native to northern South America, Trinidad and Tobago. In the wild it grows 3-10 m tall. The trunk is thorny, nearly all parts are armed with long sharp spines, even the leaf surfaces. Leaves are paripinnate, consisting of 15-20 pairs of linear pinnae. Leaflets are broad at the tips, ruffled and spiny. Flowers monoecious, grouped in panicles axillary and interlayer compounds. Fruits are bright red with an orange endocarp. Though not widely consumed, its fruits are edible and the fruit pulp is sweet and rich in vitamin A. Oil is extracted from the seeds of this palm which has the flavour resembling that of coconut oil. (Lorenzi *et al.*, 2006).

***Attalea cohune* Mart.:** Palm tree native to Mexico and parts of Central America, growing to 20 m tall with a trunk conspicuously ringed with old leaf scars. Inflorescence emerge from among the 15-30 pinnate leaves. Brownish yellow fruits are born on pendulous clusters containing 1-3 seeds, which can be made into butter. Oil extracted is used in treating skin ailments and even as a mosquito repellent. (Standley and Steyermark 1946). Seed can be consumed raw or cooked. The ellipsoid fruit, which is about 6cm long, is produced in large clusters and is used in making a sweetmeat. A cooking oil is extracted from the seeds and tender shoots are used as a vegetable.

***Coccoloba uvifera* (L.) L.:** Small tree found near sea beaches throughout tropical America. It reaches a maximum height of 8 m, but usually just around 2 m tall. The bark is smooth and yellowish. Leaves large, round,

Table 1: List of exotic edible fruit trees in the Thiruvananthapuram Napier Museum and Zoological Park garden

| S.No. | Binomial | Family | Common name | Edible Part |
|-------|---|----------------|-------------------------------------|--|
| 1. | <i>Adansonia digitata</i> L. | Bombacaceae | African baobab tree | Young leaves, flowers, tender root, seed, fruit pulp |
| 2. | <i>Aiphanes horrida</i> (Jacq.) Burret | Arecaceae | Ruffle palm | Fruit and seed |
| 3. | <i>Attalea cohune</i> Mart. | Arecaceae | American oil palm | Young shoots, fruit, seed, wine from sap |
| 4. | <i>Coccoloba uvifera</i> (L.) L. | Polygonaceae | Seagrape | Fruit |
| 5. | <i>Couroupita guianensis</i> Aubl. | Lecythidaceae | Cannon ball tree, 'Naagalingamaram' | Fruit |
| 6. | <i>Crescentia cujete</i> L. | Bignoniaceae | Beggar's bowl | Young leaves, young fruits and seeds |
| 7. | <i>Diospyros discolor</i> Willd. | Ebenaceae | Velvet apple | Fruit |
| 8. | <i>Monodora myristica</i> (Gaertn.) Dunal | Annonaceae | African nutmeg | Seeds |
| 9. | <i>Muntingia calabura</i> L. | Elaeocarpaceae | Bird's cherry | Fruit, leaf (for making tea) |
| 10. | <i>Nephelium lappaceum</i> L. | Sapindaceae | Rambutan | Fruit |
| 11. | <i>Parkia biglandulosa</i> Wight & Arn | Mimosoideae | Badmiton ball tree | Seedlings, fruit pulp, seed |
| 12. | <i>Parmentiera cereifera</i> Seem. | Bignoniaceae | Candle tree | Fruit |
| 13. | <i>Persea americana</i> Mill. | Lauraceae | Avocado, Butter fruit | Fruit, leaf (as flavouring agent) |
| 14. | <i>Pithecellobium dulce</i> (Roxb.) Benth. | Mimosoideae | Manila tamarind | Fruit, seeds |
| 15. | <i>Psidium cattleianum</i> Afzel. ex Sabine | Myrtaceae | Strawberry guava | Fruit |

leathery with a red primary vein. In the West Indies, they boil the wood to yield a red dye. Wood from larger trees is prized for cabinet work. Flowers, fragrant white borne on spikes. Female trees bear purplish fruit, in large grape-like clusters. The fruit is fleshy with a hard stone. Ripe fruits are either consumed raw or made into jams, 'seaside jellies', wines, soups and beverages. (Odenwald and Turner, 2006).

***Couroupita guianensis* Aubl.:** It is a tree native to the rainforests of Central and South America with smooth bark. Leaves simple, alternate, crowded at the apices of branchlets, intercostae reticulate. Flowers dioecious, pink, in racemes on trunk on lower branches, sepals short, petals 6, stamens many, fused into a curved spatulate androphore, ovary half inferior. Fruit globose, berry, surface scurfy, seeds 65-550 in number. This is a highly underutilized fruits, owing to its very pungent smelling fruit flesh. The fruits are edible but very rarely consumed, whereas it is commonly fed to livestock.

***Crescentia cujete* L.:** Native to Central and South America. Small trees up to 8 m high. It is naturalized in India. Leaves in scattered fascicle. Flowers solitary or in pairs, borne on main trunk or mature branches. Calyx 2-lobed to the base. Corolla bell-shaped, yellow, white or pale green with purplish or brown markings, lobes 5, unequal. Stamens 4, didynamous + 1 staminode, stigma bilamellate. Fruits broadly ellipsoid to globular, smooth, greenish yellow or black; seeds many, embed in the pulp. The fruit pericarp is used as vessels, young fruit is pickled and seeds are eaten when cooked.

***Diospyros discolor* Willd.:** Tree native to the Philippines growing 15 m tall. Bark blackish or dark brown, peeling off; inner bark pinkish. Leaves alternate, rigidly coriaceous, oblong, young leaves initially silver or golden on lower surface. Male flowers in 3-7 flowered axillary cymes; calyx deeply 4 lobed, about, corolla tubular, 4-lobed, creamy-white; stamens many, female flowers solitary, with 4-5 staminodes. Ovary, 8-10 celled. Fruit globose, fleshy, densely rusty or yellowish velvety, seeds 4-10. The fruit pulp is edible and has a taste very similar to that of cream cheese.

***Monodora myristica* (Gaertn.) Dunal:** Branching tree with a grey-barked trunk and can reach 35 m high in nature. It has large long leaves at the end of its branches. The leaves are purple at first but turn a smooth deep green on the upper side with paler green underneath. They are prominently veined and the petiole is purplish. Flowers, scented and waxy, suspended on long stalks. 3 calyx lobes and 3 petals arranged in 2 whorls. The yellowish calyx lobes, frilled and splashed with red. Petals,

paler with purplish red spots. Fruit is large, woody and is filled with brown seeds embedded in aromatic pulp. Seeds of the tree are ground and used as a condiment.

***Muntingia calabura* L.:** Native of Tropical America and West Indies, it is the sole species in the genus. It was introduced to India and other Asian countries for its shady canopy, but its nutritive potential still remains underexploited. Tree grows up to 7 m high with spreading branches, branchlets densely villous. Leaves simple, alternate, lamina, oblong-lanceolate, margin serrate, glandular hairy above, woolly beneath. Flowers dioecious, white, sepals 5, lanceolate, densely pubescent, petals 5, thin, ovate, crumpled in bud, stamens many. Ovary superior, ellipsoid, 5-celled, ovules many. Fruit is a red or yellow, subglobular berry, seeds many small. The berries are very sweet when ripe and can be consumed as such or made into jams, tarts and pies (Facciola, 1998).

***Nephelium lappaceum* L.:** Fairly large tree in natural vegetation, native to West Malaysia and Indonesia. Clonal trees are small growing to 4-7 m high. Leaves alternate, paripinnate, leaflets obovate. Inflorescence usually terminal. Flower either monoecious or dioecious, actinomorphic, whitish, sepals 4-5, petals usually absent. Stamens 4-9, in males. Pistil di-merous, densely hairy, well developed in hermaphrodite flowers, ovary warty. Fruits are ellipsoid to subglobular, yellow to purplish red, seed covered by a thick, juicy, white to yellow, translucent sarcotesta. This juicy aril is edible and is rich in vitamin C. Consumed raw or made into squashes, jellies and preserves. In the sour varieties, the flesh is also used in flavouring curries. (Arenas *et al.*, 2010).

***Parkia biglandulosa* Wight & Arn:** Tall tree native to West Africa. Leaves are bipinnate, with 20-40 pairs of pinnae and 60-100 pairs of leaflets. Flowers are in dense subspherical heads. Calyx tube glabrous, teeth pilose. Corolla tubular, cleft half-way down, the segments subvalvate. Stamens 10, filiform filaments united in the lower part with each other and the corolla-tube, anthers narrow, glandless. Ovary stalked, many-ovuled, style filiform, stigma minute capitate. Fruit is an edible downy pod which encloses within, a yellow sweet farinaceous fruit pulp and is consumed fresh or processed into squashes and preserves. The seed and leaves of this tree are also edible (Balfour, 1885).

***Parmentiera cereifera* Seem.:** It is endemic to Panama grows up to 6 m tall. The oppositely-arranged leaves are each made up of three leaflets. They are borne on winged petioles up to 5 cm long. The flower is solitary or borne in a cluster of up to four. The 5-lobed corolla is greenish white. The fruit is a taper-shaped berry up to 60cm



Fig. 1: From top left: *Adansonia digitata* L., *Aiphanes horrida* (Jacq.) Burret, *Attalea cohune* Mart., *Coccoloba uvifera* (L.) L., *Couroupita guianensis* Aubl., *Crescentia cujete* L., *Monodora myristica* (Gaertn.) Dunal, *Muntingia calabura* L., *Nephelium lappaceum* L., *Parkia biglandulosa* Wight & Arn, *Parmentiera cereifera* Seem., *Persea americana* Mill., *Pithecellobium dulce* (Roxb.) Benth., *Psidium cattleianum* Afzel. ex Sabine

long. It is green, ripening yellow and waxy in texture. Hanging from the branches these slim, yellow-ochre fruits look exactly like freshly-dipped candles hung out to dry. Even though the flesh is fibrous, the fruit of *P. cereifera* is consumed raw, for its sweetness and the flavour that

resembles that of sugarcane. (Lim, 2012) The more commonly consumed edible species in this genus is *Parmentiera edulis*. (Fruitpedia).

***Persea americana* Mill.:** Tree native to Tropical America, growing to 15 m high. Leaf buds perulate with imbricate scales. Leaves simple, alternate, lamina elliptic-ovate with entire margin. Flowers dioecious, subsessile, greenish, in compact terminal panicles, perianth tube turbinate, lobes 3+3, stamens 9, ovary superior, sessile, hairy, style slender, stigma simple. Fruit is a single seeded berry, with copious mesocarp. The flesh of the fruit is creamy with a buttery flavour. It is eaten raw or used in cakes, bread spreads, milkshakes, ice creams and as a substitute for butter.

***Pithecellobium dulce* (Roxb.) Benth.:** Native to the Pacific Coast and adjacent highlands of Mexico, Central America and northern South America, growing to a height of about 10 to 15 m. It is a fast growing tree with spiny trunks, growing upto a height of 10 m (Duke, 1983). The leaves are paripinnate with 4 leaflets. Small thorns can be seen on each side of the leaf pedicels, thornless varieties are also there. The leaflets shed in

succession and therefore are deciduous. The inflorescences is an axillary panicle, bearing small, white-greenish, slightly fragrant flowers. Fruits are greenish-brown to red-pinkish, indehiscent pods. Pods are rather thin and is set in a spiral of 1 to 3 whorls. The pods contain 10 seeds. Enclosed by the edible fruit pulp are black shiny, circular and flat seeds.

Psidium cattleianum Afzel. ex Sabine: Small tree native to Brazil, with smooth brown bark and slender branches, which may reach heights of up to 12 m, although typically 2-4 m. The leaves are oval to elliptical, smooth and leathery. The fragrant white flowers are tubular with 5 petals, solitary or in clusters of 3 at the axils. The fruits, which are produced when the plants are 3 to 6 years old, are round to somewhat oval, about the size of a walnut, with a thin skin that ripens to a color ranging from yellow to dark red or purple. The fruits can be eaten fresh and are sweet with an appetizing aroma. It can also be made jams, jellies, custards, sherberts and is a good source of niacin and vitamin C. Fruit pulp is also processed into a type of wine (Roecklein and Leung, 1987)

Among the 15 genera of exotic fruit trees studied, except *Nephelium lappaceum* and *Persea americana*, all others are highly underutilized and have the potential to be domesticated and commercialized. Knowing their benefits and uses in detail will help in exploring the domestication prospects.

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